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ABSTRACT

This report presents a comprehensive strategy developed by the New Mexico Education Technology Planning Committee to maximize resources in educational technology to achieve the long-range goals adopted for education in the state. Four basic strategies are recommended: (1) to forge relationships between schools and businesses, and partnerships between public and private sectors generally; (2) to complete the statewide educational telecommunications network; (3) to train and support teachers and faculty; and (4) to establish a structure and process for planning and implementing educational technology. A three-phase plan of implementation is also outlined, and includes a focus on teacher training in microcomputers and other technology, increased public awareness, and other considerations necessary to effect educational effectiveness and educational change. Projected outcomes from such a plan are noted. (10 references) (DB)

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New Mexico's *Challenge 2000*

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I. New Mexico's Challenge 2000 – Executive Summary

New Mexico's educational system is facing a challenge — a challenge created by the fast-moving pace of technology driving an increasingly competitive world market. *The technology driving the need for change can itself be harnessed for learning.*

Steps have already been taken to bring educational technology into many New Mexico schools and to train some teachers in its use, but much more needs to be done. The New Mexico Education Technology Planning Committee (ETPC) was created to develop a long-range strategy to maximize state resources in educational technology to achieve the long-range goals adopted for education in New Mexico. The ETPC comprises representatives of the educational community, legislative staff, national laboratories, private industry, libraries, and museums.

This report defines the challenge, recommends four basic strategies, and outlines a plan of implementation. The four strategies are: forge public-private sector partnerships, complete the statewide educational telecommunications network, train and support teachers/faculty, and establish a structure and process for planning and implementing educational technology.

Partnerships between the public and private sectors, between educators and entrepreneurs, will make technical expertise available to New Mexico educators. The resources of the private sector, which has a vital stake in a well trained workforce and educated voters, will be integrated into the educational system and distributed equitably throughout the state.

Telecommunications help compensate for the disparity between urban and rural areas of New Mexico. The statewide telecommunications system will open classrooms to the world's knowledge and place the resources of libraries and museums within the reach of all New Mexico citizens. New Mexico has made a good start, but initiatives started in a variety of agencies and institutions must be coordinated to avoid duplication of efforts.

Training and support for teachers/faculty are imperative if the equipment and programs are to achieve their promise. Trained teachers will pull technology into the schools and put it to work to help students learn. Teachers must have time to learn new technologies as well as have continuing support as they work with students. Obsolete equipment must be replaced and outdated software upgraded.

Technology in the schools can create possibilities for more individualized attention, cooperative learning and research, and critical thinking. Communication between parents and schools can be easier, and administrative tasks can be done more efficiently. While the trained teachers of New Mexico, who understand its benefits, work to pull educational technology into the schools, the state must push it along by actively encouraging, guiding, and rewarding long-range programs that effectively integrate educational technology into the learning process. Technology in the schools is an integral part of other reform efforts in education.

Action must be taken if New Mexico is to meet the challenge. Partnerships between the public and private sectors are essential to implementation of the committee's recommendations. A process for implementing the program must be established with clearly defined lines of responsibility, crisply focused goals, and definite priorities. Public support for this strategy is required, and legislative initiatives must be created and carried through if the promise of educational technology is to be realized.

Strategy for Educational Technology

This report defines the challenge, recommends four basic strategies, and outlines a plan of implementation.

Partnerships–
Forge public-private sector partnerships.

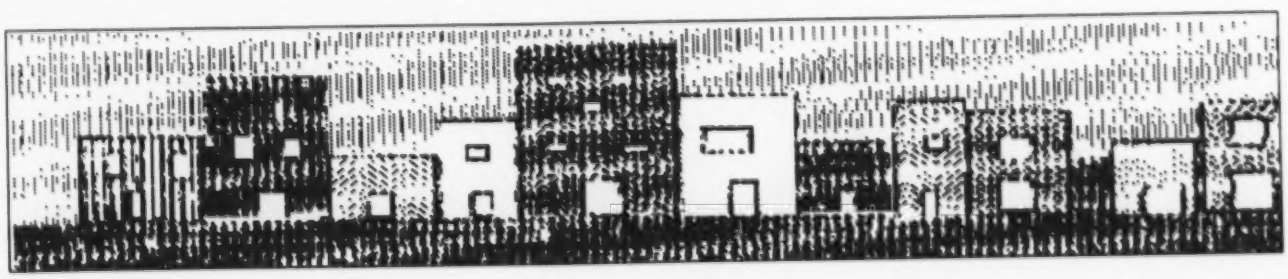
Telecommunications–
Complete the statewide educational telecommunications network.

Training–
Train and support teachers and faculty.

Technology in the schools–
Establish a structure and process for planning and implementing educational technology.

As citizens of the 21st century, our children must handle a computer keyboard with as much ease as the children of the 19th century handled a buggy whip or steered a plow.

-President George Bush



II. The Challenge

The technology driving the need for systemic change is itself a valuable tool for learning.

The United States has one of the most ambitious educational programs in the world. In acknowledgment of its importance, the New Mexico Legislature allocates more money to education than to any other single item. Yet today's educational system is under fire for having a high dropout rate and producing many graduates who are unable to function as responsible citizens and competent workers in the technological age. The private sector has told New Mexico that the quality of its labor force is a critical factor in the decision to locate commercial enterprises in the state. The national leadership is calling for a systemic change in educational methods and administration. At this critical time, New Mexico is challenged to find ways of spending its education money most effectively to benefit all its citizens. Consider the challenges to New Mexico's educational system:

Technology advances more rapidly than schools can keep up. How can we provide our students with enough basic knowledge to fit into today's workplace and enough flexibility to adapt to its rapid changes?

New Mexico is a rural state with few urban centers. How can learners in isolated areas enjoy the same educational opportunities as learners in large urban areas?

New Mexico's population is culturally and linguistically diverse. How can we assure all groups an equal opportunity to share the benefits of a modern education?

New Mexico has limited funds to spend on education. How can those funds be used to best advantage?

New Mexico's libraries and museums have enormous resources to share with the educational community. How can all citizens gain access to those resources, regardless of where they live?

New Mexico has many commercial and industrial members in the private sector and is unique in having two United States National Laboratories. How can these forces be marshalled in support of education?

III. Laying the Foundation

Seeking to meet these challenges, the State Board of Education and the Commission on Higher Education established the Education Technology Planning Committee in 1990 and enlisted members from the private sector, educational community, state library and museum system, legislative staff, and national laboratories. The ETPC defined its mission as helping the New Mexico educational system achieve its long-range goals through improved use of technology and better coordination of educational technology projects in New Mexico. Its focus was not on technology for its own sake, but rather on ways technology can be used as a tool to assist learning, equalize educational opportunities, and ease administrative burdens.

The ETPC began its work with a research program before starting to formulate a recommended plan of action. The committee reviewed state and national plans and policies for educational technology, including surrounding states' plans; surveyed the current status of educational technology in New Mexico public schools, postsecondary institutions, cultural institutions, and libraries; reviewed literature on the effectiveness of technology in education; assessed the need for educational technology in New Mexico; and participated in focus group discussions with members of the educational community.

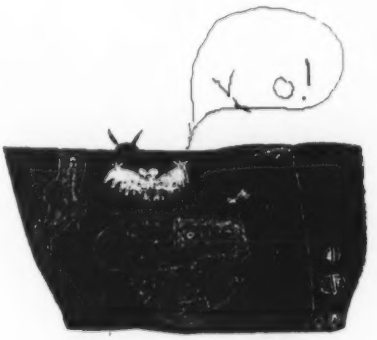


Illustration by Andrew Norsky

Basic communications—The basic means of modern communication, such as telephones, telefax, and photocopiers, are necessary to fulfill the mission of public education. High-speed photocopiers capable of enlarging, reducing, and printing on both sides of the paper save valuable teacher time and conserve paper, as well. Parents and teachers must be able to communicate readily, making easy access to telephones and the installation of voice mail systems imperative. Schools reach out to the rest of the world through telecommunications, and telephone lines are one important channel for both data and facsimile transmission. Local nodes to remote databases eliminate long-distance calls, thereby significantly expanding the range of resources available to a school.

Distance learning—Television and videotape have largely replaced film, but the world of distance learning has only begun to be explored. A teacher in a properly equipped classroom can simultaneously be brought to many classrooms in schools, universities, and businesses through telecommunications. Adding telephone connections allows interactive instruction whereby students in remote sites can ask questions and participate in discussions with the teacher. The possibilities are limited only by the availability of personnel, equipment, and good programs.

Laser disks—Laser disks hold enormous quantities of information by today's standards. An encyclopedia and half a dozen dictionaries can be stored on a single disk, and only a small computer and disk reader are required to bring their contents to the screen. This technology is already creating enormous changes in libraries. The same technology can bring multimedia programs into the classroom and can even place an electronic cadaver in the medical classroom.

Computers—Computers are the single most important item of new technology in widespread use today, and they have entered the workplace with unprecedented speed. Most people are aware of the use of computers for personal productivity and administrative functions, but few realize the innovative ways they can be used for instructional purposes. Computers can help teach children learn to read, translate science experiments into basic principles students can grasp readily, and motivate students to stay longer on a task. Computers are also a means of communication, allowing people to interact almost instantaneously over long distances and to transmit data quickly. A computer can bring the catalogs of the world's libraries to a remote New Mexico school.

Courtesy of Intel Corporation

"Our employees of the future will need to be prepared in skills ranging from computer and electronics to machine operation and mechanics. This is why Intel's community involvement program focuses on math and science oriented education programs in New Mexico."

–Michael R. Splinter
Vice President and General Manager, Intel Corporation

IV. Findings

After completing the research phase of its work, the ETPC reached the following conclusions:

Photo by LeRoy Sanchez

We have to have programs in school that teach youngsters how to use technology to solve real problems.

–Governor Bruce King

Appropriate use of technology as an integral part of the learning process increases learning effectiveness and efficiency.

Educational technology can improve the educational opportunities of New Mexico's geographically and culturally diverse population.

Educational technology is inextricably linked to systemic change in educational methods and administration.

The current initiatives for systemic change in New Mexico must be better coordinated in order for educational technology to be most effective.

Many New Mexico schools have inadequate telephone, telefax, and photocopier equipment to meet current instructional needs.

Funding formulas for higher education and K-12 education must explicitly provide for the incorporation and continuing support of educational technologies.

To derive maximum benefit from the money spent on educational technology, New Mexico must give high priority to adequate training and support for teachers.

Higher education must play a central role in bringing educational technologies into the education system at all levels.

Boards of education, administrators, and legislators should assure that their decisions do not discourage higher education from incorporating educational technologies into its curricula.

New Mexico libraries and museums are important educational resources, and educational technologies will bring those resources into previously unserved areas.

New Mexico's two national laboratories are vital educational resources.

Limited financial resources and the need to coordinate many existing educational reform initiatives make collaboration mandatory.

The general public and many educators are unaware of the potential benefits of educational technologies.

V. Basic Principles and Roles

Any strategy adopted to meet a challenge must be based on fundamental principles. In formulating its basic principles and allocating roles, the ETPC examined the needs of New Mexico's educational system and the relationship between the state and local educational institutions.

Basic Principles

Applications of educational technology must:
support local, state, and national educational goals;

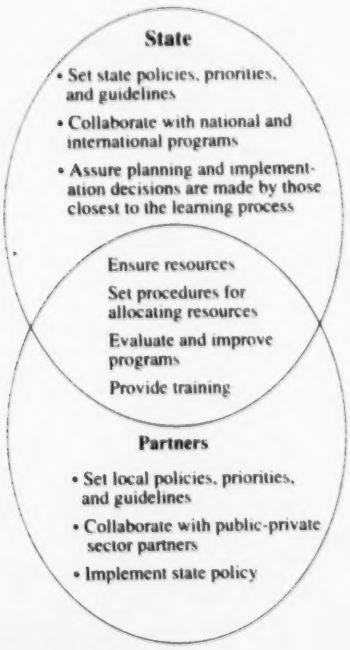
have the flexibility to adapt to New Mexico's wide range of cultural and demographic variations;

utilize New Mexico's unique technology resources to the maximum extent possible;

promote systemic change; and

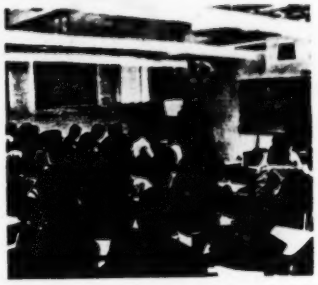
include mechanisms for setting priorities and continuing improvements over time.

The State of New Mexico will provide overall guidance to local initiatives; facilitate collaboration among the public and private sectors, schools, institutions of higher learning, libraries, and museums; and assure that planning and implementation decisions are made by those closest to the learning process.


State
• Set state policies, priorities, and guidelines
• Collaborate with national and international programs
• Assure planning and implementation decisions are made by those closest to the learning process
Ensure resources
Set procedures for allocating resources
Evaluate and improve programs
Provide training
Partners
• Set local policies, priorities, and guidelines
• Collaborate with public-private sector partners
• Implement state policy

VI. Meeting the Challenge

The potential benefits of educational technology are clear. However, New Mexico must have clear goals in mind and firm priorities established if the state is to achieve maximum benefit at minimum cost. The ETPC recommends a strategy consisting of four major elements and a plan of implementation. Each strategy element responds to a particular set of challenges and leads to a vision of the future.



Partnerships — *forge public-private sector partnerships*

Challenge

Educational technologies are expensive, and New Mexico is not a wealthy state.

New Mexico is largely a rural state, and its rural schools do not have the private sector support enjoyed in the population centers.

Initiatives launched by institutions of higher education to bring educational technology into the curricula lack the broad public backing required to win legislative support.

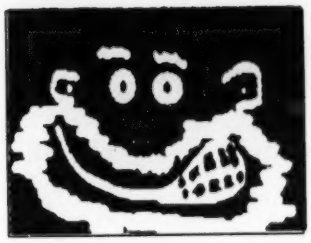
Vision: Where this strategy will take us

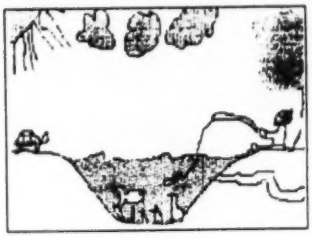
Partnerships between the public and private sectors will make technical expertise available to New Mexico educators at the planning stage of educational technology programs.

Cooperation between the private sector and higher education will create sound training programs in response to identified needs and make these programs available to all New Mexico teachers.

The resources in management and technical expertise, equipment, and funds that the private sector donates will be integrated into the educational system and distributed equitably throughout the state.

The base of public support for education will be significantly broadened by giving the private sector a voice in the councils of the education community.





Telecommunications —
complete the statewide educational telecommunications network

Challenge

The geography of New Mexico restricts the range of public services and educational opportunities available in rural areas. Urban schools offer a variety of courses and programs that are not financially feasible in rural areas. The magnificent resources of New Mexico's libraries, museums, universities, national laboratories, and private sector are generally available only to those who live near them.

Institutions and schools around the state have begun to develop their educational telecommunications capacities independently. Lack of coordination results in duplication of efforts, incompatibility of equipment, and inefficient use of resources.

Telecommunications are complex: to use each system requires different knowledge and skills. The teachers and institutions providing distance learning services must help the learners to feel at ease with the technology.

Vision: Where this strategy will take us

A comprehensive statewide telecommunications system will link schools, colleges, universities, libraries, museums, businesses, and homes throughout New Mexico. The resources and expertise of each will be available to all others.

Rural learners will have access to the same educational opportunities and resources as urban learners.

The strategy recommended by the Educational Telecommunications Advisory Committee will be adopted.

State government will have an efficient means of disseminating public service information about agriculture, health care, emergency services, consumer issues, social problems, and cultural activities.

New Mexico will overcome its geographic isolation by tapping into national and international telecommunications systems such as bulletin boards, electronic mail, databases, teleconferencing, and supercomputers.

Training —
train and support teachers and faculty.

Challenge

New technologies are constantly appearing on the market, and educators must keep up with these changes.

Using a computer as a teaching tool is qualitatively different from using it as a business tool. Educators require special training.

Colleges and universities should teach future teachers how to integrate educational technology into the school curriculum.

Some educators, unaware of its benefits, resist the introduction of educational technology.

Many teachers are reluctant to spend time in training.

Training programs must be coordinated with access to equipment because new skills must be exercised to be retained.

Even trained users need continuing support and help to keep current with the technology.

Vision: Where this strategy will take us

Carefully planned training programs based on identified needs and subject to thorough evaluation will be available statewide.

Training that is carefully coordinated with actual classroom use will help teachers and faculty become adept at using educational technology in the classroom.

The teachers who have enjoyed preservice training in technology will be able to integrate new educational technologies into the classroom as they appear on the market.

The private sector will be a partner with the educational community in offering training and continuing support.

Trained educators and administrators will recognize the potential benefits of educational technology and become a powerful "pull" for its use.

Technology in the schools —
establish a structure and process for planning and implementing educational technology

Challenge:
Many separate programs have been initiated to bring technology into the classroom, but no process has been established to promote, assist, and coordinate such initiatives.

Accountability, leadership, and efficiency are required to bring educational technology into New Mexico classrooms.

Technical expertise is required to evaluate the cost, feasibility, and potential benefits of educational technologies while the educators' expertise is required to use technology effectively.

Hundreds of new items of educational technology appear on the market every year. Teachers need help to keep abreast of these new developments.

Technology utilization in the learning process is most effective when integrated with other systemic change efforts.

Schools may receive money to buy computers; however, software, printers, training, technical support, and upgrades are overlooked.

Vision: Where this strategy will take us
Because the planning necessary to keep pace with new advances in educational technology will be coordinated through a statewide structure and process, all New Mexico schools will have at least the basic level of technology and all students will have access to the same educational opportunities.

Educators at all levels in New Mexico will be able to draw on expert guidance to help in their planning and implementation of educational technology.

VII. Reaching the Vision

This plan has sketched a vision of the future that educational technologies and public-private sector partnerships could bring. Now the task is to take the steps that will lead to the future we want rather than the future that would result from our inaction.

Agents of change
Establish a public-private sector partnership, the Educational Technology Coordinating Council (ETCC), to provide guidance and oversight to the planning and utilization of educational technology throughout New Mexico.

The ETCC will draw its members from business and industry, national laboratories, public and private schools, postsecondary institutions, parent and community groups, and the executive and legislative branches of state government.

The ETCC — through its Training, Telecommunications, and Plan Review and Coordination subcommittees—will guide and coordinate the adoption and integration of educational technologies throughout the state and raise public awareness of the need for and benefits of educational technology.

Establish an Educational Technology Office (ETO) to serve as the executive agent of the ETCC to implement educational technology programs throughout New Mexico.

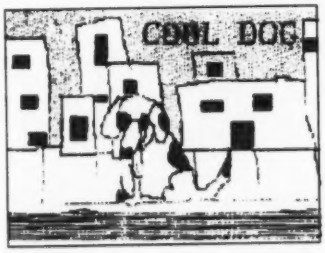
The ETO will comprise a staff that combines teaching and technical expertise in order to be credible in both arenas.

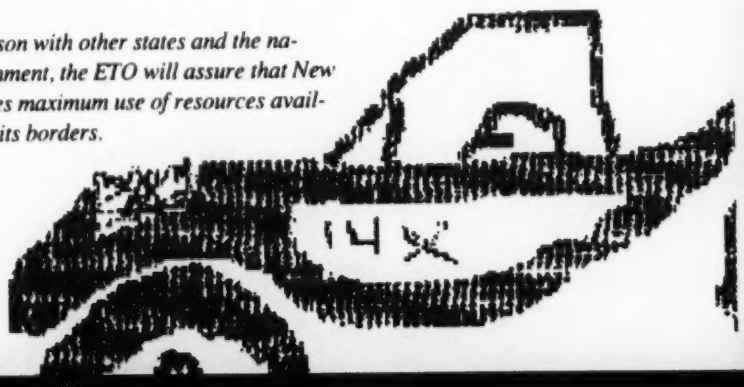
Educational technology field officers will work throughout the state to advise and support local educational institutions with regard to technology planning.

The ETO will provide the coordination needed to prevent duplication of efforts and to distribute resources equitably.

Through liaison with other states and the national government, the ETO will assure that New Mexico makes maximum use of resources available outside its borders.

The focus is action at the federal, state, and local levels to stimulate systemic education change–to move beyond isolated model programs to full integration and effective use of learning technologies in schools.





Process of Change

Phase 1: Two years
Bring all schools up to basic level communications

Focus on teacher and faculty training

Increase public awareness of educational technology

Trained teachers and faculty are the "pull" factor that will pull technology into the classrooms while the public-private sector partnerships "push" from outside.

Phase 2: Three Years
Emphasize wide-area access

Expand the technology base

Continue public awareness programs

When all New Mexico schools have reached the basic level of communications capability, they will be able to reach out beyond the walls of the classroom to access the world's resources.

Phase 3: Ongoing
Emphasize evaluation

Continue improvement

Maintain a high level of public awareness

Phase 1

All New Mexico schools should achieve at least the basic level of communications within two years. Basic level communications are defined as direct access to telephone service, telefax, photocopiers, audio and video recorders, television equipment, and computers with modems.

The ETCC/ETO will define basic level communications.

The ETCC/ETO will draw on legislative and private sector sources to help all New Mexico educational institutions find the funding and technical assistance they need to reach the basic level.

The ETO will help educational institutions assess needs, select technologies, and evaluate their effectiveness.

The ETO will plan the completion of the statewide telecommunications network in accordance with the strategy recommended by the Educational Telecommunications Advisory Committee.

Teachers and faculty obviously require training in a technology before their students can benefit from it, but there is another more subtle benefit. Once people have the opportunity to use a technological tool, be it a computer or a satellite TV antenna, they want to use it more and more; however, untrained persons are likely to reject technology and resist change. Trained teachers and faculty are the "pull" factor that will pull technology into classrooms while the public-private sector partnerships "push" from outside.

The ETCC/ETO will seek and publicize incentives to encourage teachers and faculty to spend time in professional development.

The ETO will coordinate needs assessments with public schools and institutions of higher education.

The ETO will coordinate course development and evaluation with institutions of higher education and the private sector.

Phase 2

The ETCC/ETO will coordinate all New Mexico's telecommunications networks to bring them within reach of all New Mexicans while preventing duplication of efforts.

The ETCC/ETO will assure access that allows remote schools to connect to networks without going through long-distance lines.

The ETO will assure the statewide telecommunications network is easy to access and use.

The information resources of New Mexico libraries and museums will be integrated into a statewide network.

The ETO, through its field officers, will coordinate hardware and software maintenance and upgrades, network connections, replacement of equipment, and training.

The first phase of implementation will have brought all New Mexico schools to a basic technological level. Phase 2 will expand their capacities to encompass the most effective high level educational technologies.

The ETCC will seek funding to reward carefully planned long-range programs that effectively and efficiently integrate educational technology into the learning process.

The ETCC will seek, coordinate, and distribute grants and other support from the private sector to support educational technology initiatives.

Phase 3

Phase I is the foundation that gets New Mexico's educational system on a solid footing and ready to expand into the age of educational technology. Phase 2 expands the technological base and opens the classroom to the world. Phase 3 will emphasize evaluation to assure that New Mexico schools have chosen the right technology, are using it appropriately, and are keeping pace with new advances.

The ETCC/ETO will monitor new technologies and share their findings with schools and institutions of higher education.

Institutions of higher education will lead the process of evaluating the impact of educational technologies in New Mexico.

VIII. Outcomes

What outcomes can we expect from successful implementation of the recommendations in *New Mexico's Challenge 2000*?

All New Mexico citizens will have equal access to education and information services through a state telecommunications network.

Learning experiences will be improved for all students as New Mexico teachers and faculty make effective use of technology.

The number of independent adult learners able to utilize New Mexico's information resources will increase significantly.

Dropouts and absenteeism will be reduced by the effective use of educational technology.

New Mexico businesses will be able to hire technologically literate graduates from New Mexico schools and postsecondary institutions.

Education and business in New Mexico will work as partners to improve education through educational technologies.

Learners in New Mexico will be assisted by educational technology to become competent in specific subject areas, adept at problem solving and critical thinking, and prepared to deal with a lifetime of challenging change.

A more capable work force will attract new business and industry to New Mexico.

The cultural life of New Mexico's diverse population will be enhanced.

Rural areas will become more attractive to well educated lifelong learners.

Rural students will not have to leave their homes to complete their educations.

Minority groups will have greater access to educational opportunities.

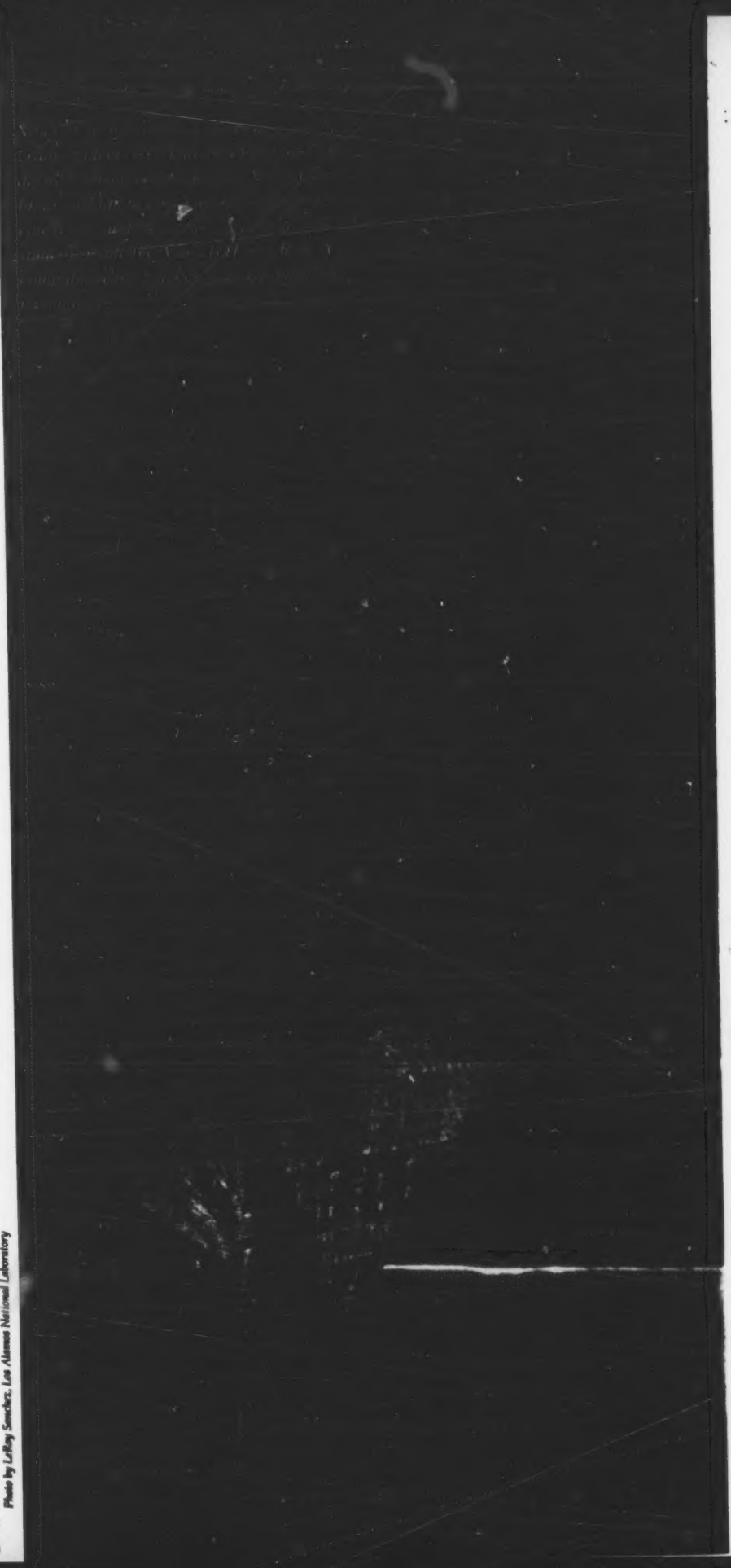


Photo by LeRoy Sanchez, Los Alamos National Laboratory

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Supplementary Research Documents

New Mexico surveys
- Public Schools
- Institutions of Higher Learning
- Libraries
- Museums

Research Evidence of the Effectiveness of Technology in Education

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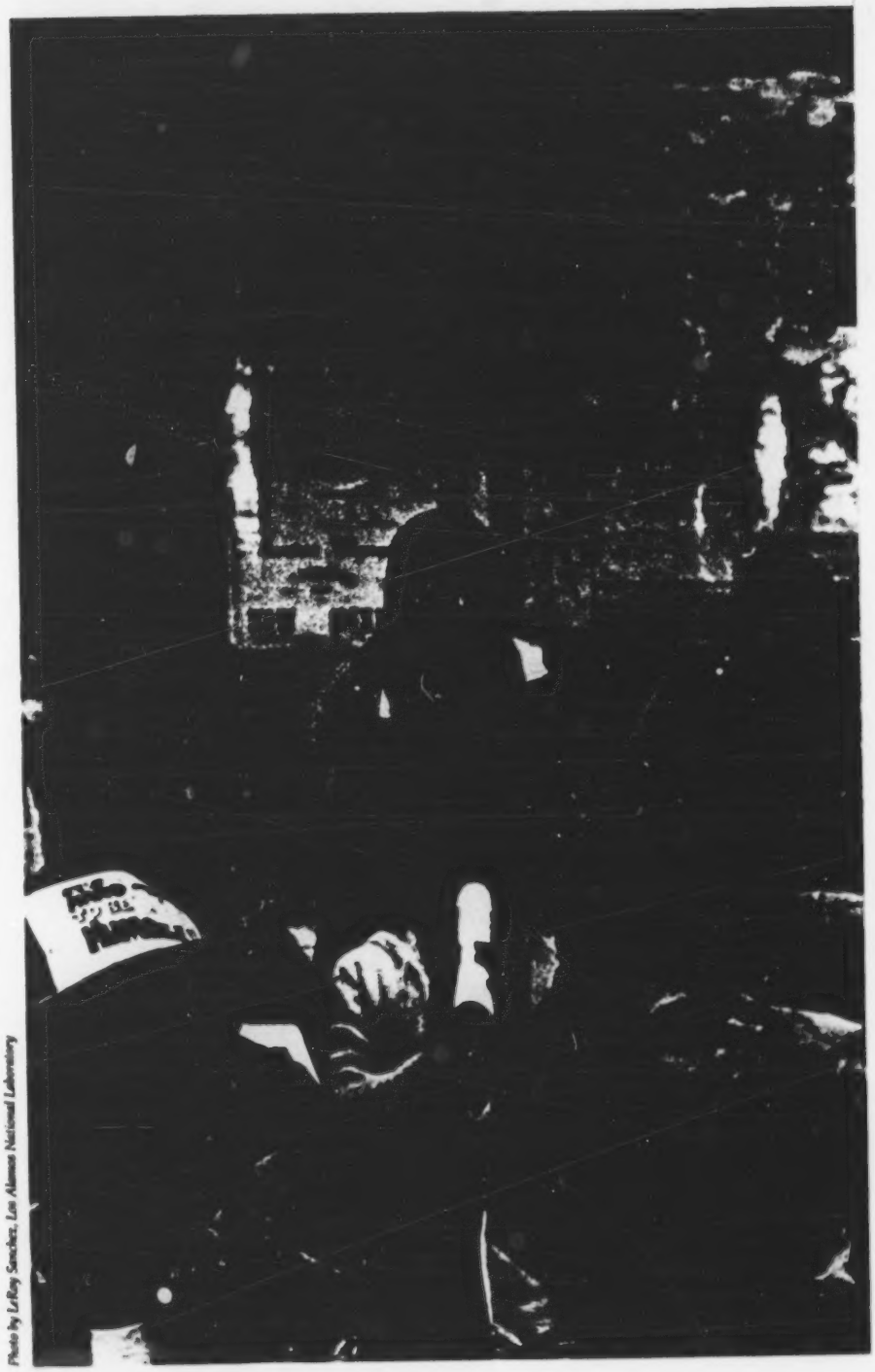

Photo by LeRoy Sanchez, Los Alamos National Laboratory

A group of 300 Florida high-school students, who were reading below the sixth grade level, raised their reading ability levels by an average of 2.6 years over one school year with the aid of a computer based adult literacy program.

A computer based language arts system introduced into the K-3 program in Burlington, North Carolina eliminated the need for the remediation program in language arts. Dropping the remediation program significantly reduced costs. New Mexico has already seen evidence of the effective use of educational technologies.

Over 120 teachers and paraprofessionals have taken courses toward provisional certification in special education offered by Project ASIST of UNM's Division of Continuing Education.

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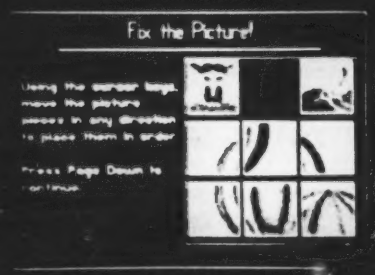

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